THE NELSON A. ROCKEFELLER INSTITUTE OF GOVERNMENT

SUNY The State University of New York

Standards and Metrics for Public Retirement Systems

Panel 3: Planning for Uncertainty with Investments

The Pew Charitable Trusts & The Urban Institute

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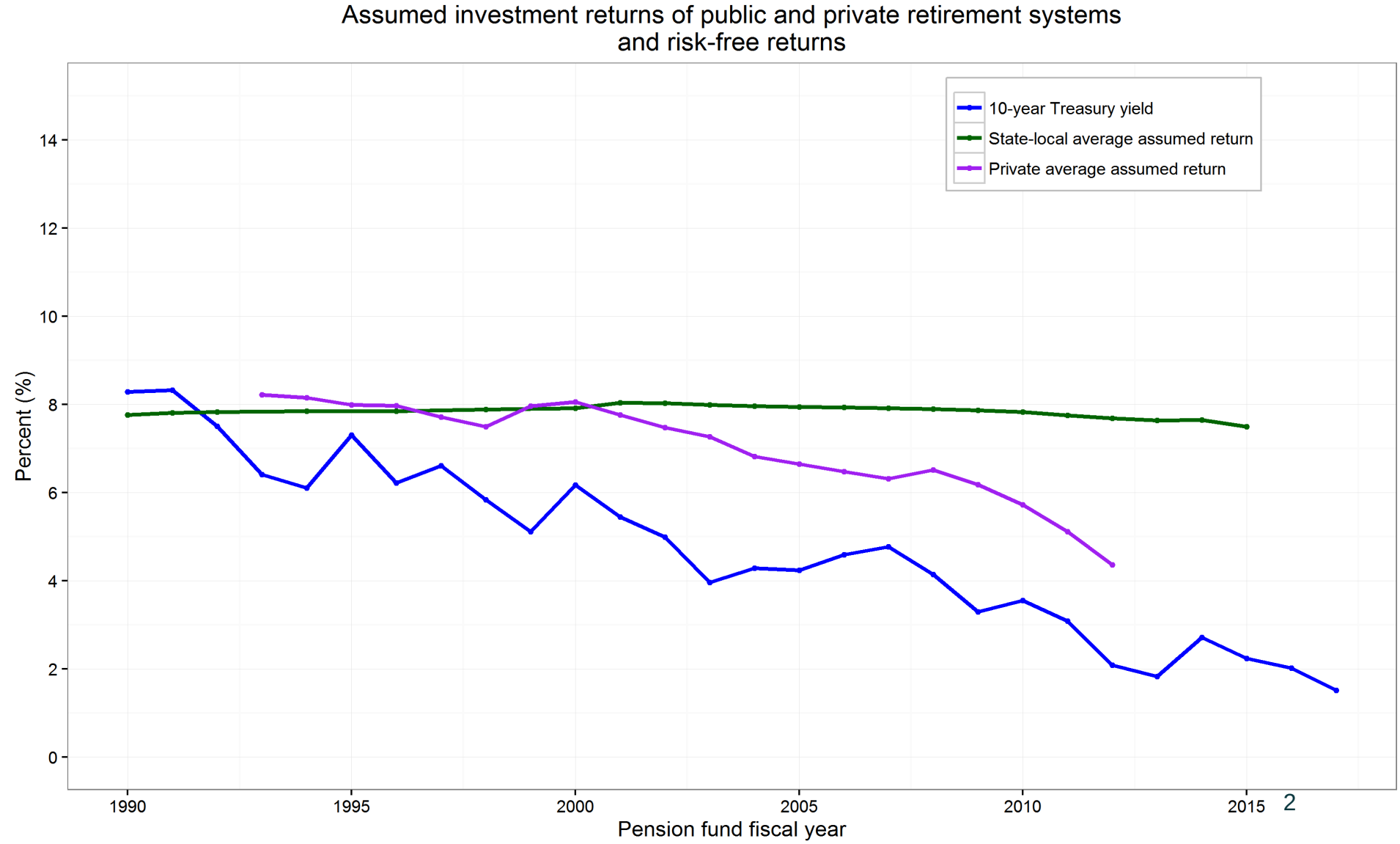
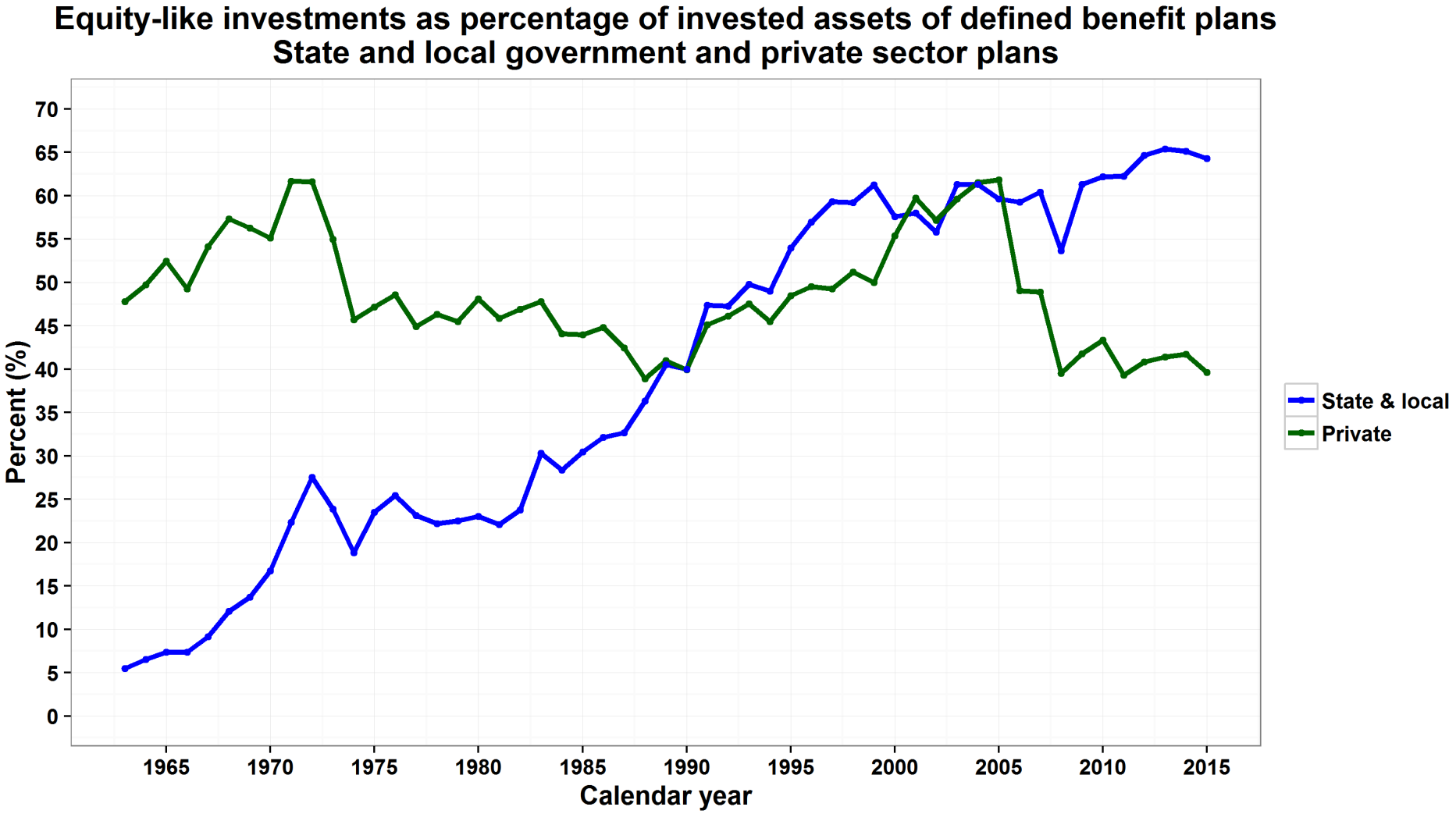
As Treasuries fell, private plans reduced earnings assumptions; public plans did not, "necessitating" greater public plan risk-taking



Public plans increased their exposure to equity-like assets while private plans recently have moved the other way

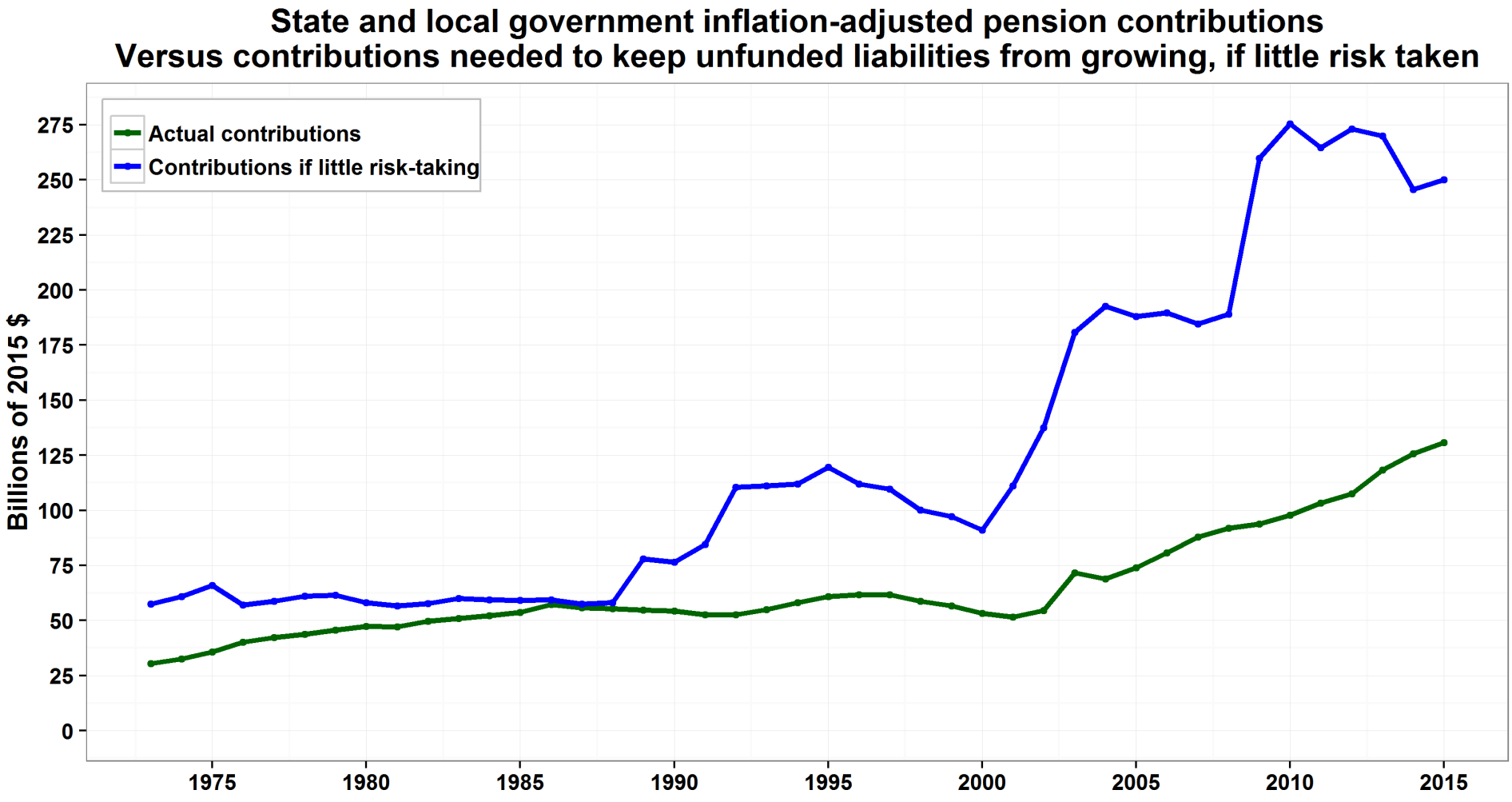


Source: Authors' analysis of Financial Accounts of the United States, Federal Reserve Board

"...gradually, U.S. public funds have become the biggest risk-takers among pension funds internationally."

Aleksandar Andonov, Rob Bauer, and Martijn Cremers, "Pension Fund Asset Allocation and Liability Discount Rates," *Available at SSRN 2070054*, March 2016, http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2070054.

Why? Governments hope that successful (but risky) investing will keep contributions low



Source: Rockefeller Institute analysis of Bureau of Economic Analysis NIPA Table 7.24. 'Little-risk' contributions are based on BEA estimates of ABO liability, which were calculated using low-risk market-based discount rates. In recent years, the rate was 5%. Liabilities and contributions estimated with risk-free rates would be considerably higher. Note that little-risk contributions would be higher still if we included amounts needed to amortize unfunded liabilities.

Consequences of a one standard deviation shortfall are 3-4x as great as in 1995, 10x as great as in 1985

- Real public pension assets are 2x as great as in 1995, 5x as great as in 1985
- Standard deviation probably is ~3x as great as 1995, >4x as great as 1985
- Volatility as % of state-local taxes is 3-4x as great as 1995, 10x as great as 1985
- A one std. deviation shortfall now would be ~27% of taxes
- Details are in the tiny table (larger in the appendix)

Potential magnitude of public pension fund investment risk
as % of taxes

Pension fund fiscal year	Invested assets, (billions of 2016 $) (A)	Volatility (risk) for a portfolio with 8% expected return (Standard Deviation) (B)	One standard-deviation risk, (billions of 2016 $) (C = A x B)	State & local government taxes, (billions of 2016 $) (D)	One standard-deviation risk, as % of taxes (E = C ÷ D)
1975	$ 335	3.7%	$ 12.4	$ 516.6	2.4%
1985	698	2.7%	18.8	685.3	2.7%
1995	1,719	4.3%	73.9	978.3	7.6%
2016	3,554	12.0%	426.5	1,576.8	27.0%
2016 / 1985	5.1	4.4	22.6	2.3	9.8
2016 / 1995	2.1	2.8	5.8	1.6	3.6

Sources and notes:
- Volatility estimates for 1975, 1985, 1995 are from Biggs (2013); 2016 is authors' assumption. There is about a 1 in 6 chance of a shortfall of 1 standard deviation or larger in a single year, under plausible assumptions.
- Invested assets from Federal Reserve Board, Financial Accounts of the United States.
- Taxes from Bureau of Economic Analysis, NIPA Table 3.3.
- Taxes and assets are in fiscal year 2016 dollars, adjusted using GDP price index.
- Risk measure is for a single year. Longer-term investment risks are larger.

But how big is that, *really*? It's big.

- A shortfall of one standard deviation *or worse* has about the same chance as rolling a single die and having a "1" come up*
- 27% of state & local taxes is a one-time loss of about $427 billion – roughly equal to a single year of total US state-local spending on highways, police, fire, and corrections combined
- Even if amortized slowly** it is a lot:
  - → increased contributions of about $23 billion now, rising 3% annually for 30 years (after which it is paid off)
  - **roughly equivalent to a 24 percent cut in all U.S. state-local highway capital spending, for 30 years**
  - *the result of a single year of moderately bad investment returns*
- Do taxpayers & other stakeholders want public pension plans taking risks of this magnitude on their behalf? Do they know?

* assuming normally distributed returns

** 30-year closed-period level percentage of pay, 7.5% interest, 3% growth

Maybe it's not really so risky?

- Pension funds are long-term investors, they can wait out ups and downs, we can count on future good returns compensating for recent bad returns and vice versa, right?
- Actually, no. The uncertainty around expected compound returns narrows as the horizon increases, but uncertainty around assets – *what plans need to pay benefits* – actually increases with time, because returns are compounded over more years.*
- While pension plans are long-term investors in the sense that they don't need much liquidity in the short term, their funders – governments – care very much about the short term. Investment-shortfall-driven contribution increases require govts to cut current services or raise taxes, to pay for services delivered in the past.

* Uncertainty around assets could increase more slowly – but still increase with time - if portfolio returns are "mean reverting" over the long term. But academic and practitioner research provides little support for this.

Thoughts on stress testing

- Stress for whom? Stress for…
  - …the financial system? (a la bank stress testing) E.g., market shock plus recession, ~3-year horizon. Maybe this should be part of risk analysis, but pension funds face longer-term risks, too.
  - …the pension fund? e.g., SOA BRP approach - 20 years of stress & 10 years recovery, 2 tests: (1) +/- 3% vs market earnings assumption, (2) 80% payment of recommended contribution. Use to evaluate funding policy.
  - …governments and stakeholders? i.e., impact on govt capacity and willingness to contribute, and to support the pension fund over the longer term. Similar to rating agency perspective, but their (primary) concern is willingness and ability to repay bonded debt timely, as opposed to willingness and ability to fund pension plans.
- Audience and perspective affect who can and should analyze stress, and which documents might report on stress.

Our work

- We are examining implications of investment risk using stochastic simulation models developed jointly with my colleague Yimeng Yin
- Our measures, so far, have been plan-focused:
  - Risk of severe underfunding. We have been using 40% as indicator of severe underfunding, but it is not magic and political stress does and should occur much sooner.
  - Risk of large contribution increase in relatively short period, as % of payroll.
  - Risk that contributions will become very high, as % of payroll (plan-dependent)
- We also use percentile measures (median, 25th, & 75th percentiles), but with caution - they can give a false sense of stability.
- We focus on the first 30 years. (Can policy makers care about the future that far ahead? We hope so.)
- We have not yet designed serious stress scenarios
- We have much work to do to improve measures, and incorporate risks to govt (e.g., contributions relative to govt revenue)

Even if plans hit their compound-return targets, at current risk levels it will be a roller coaster. How will contributing governments respond?

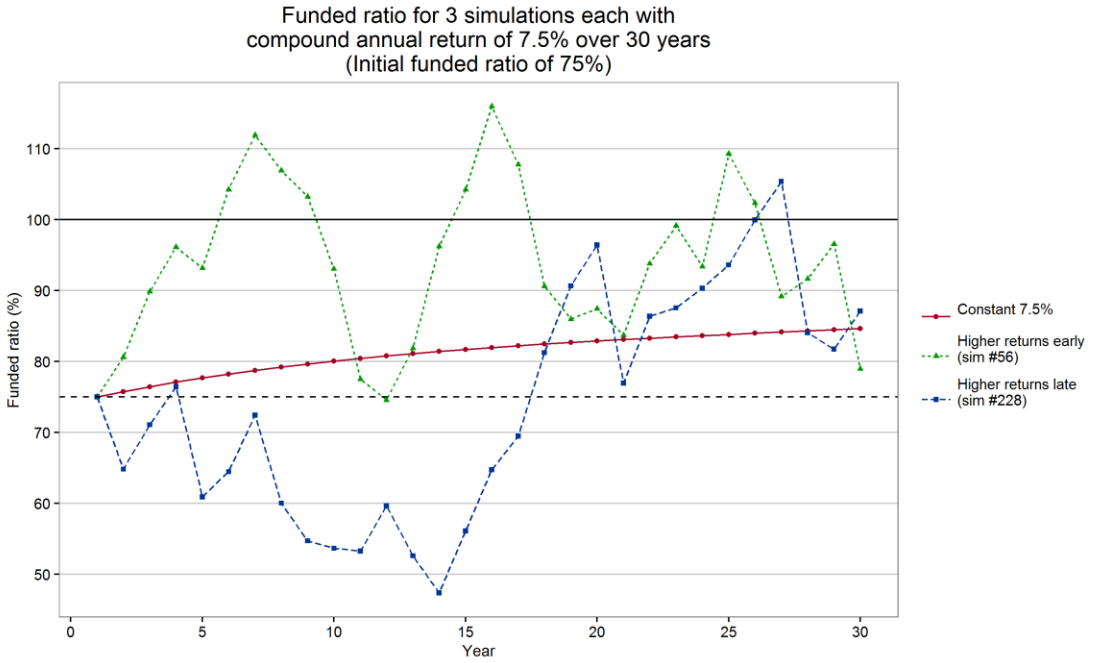
Three simulations from our model, all with compound average return of 7.5% by year 30*:

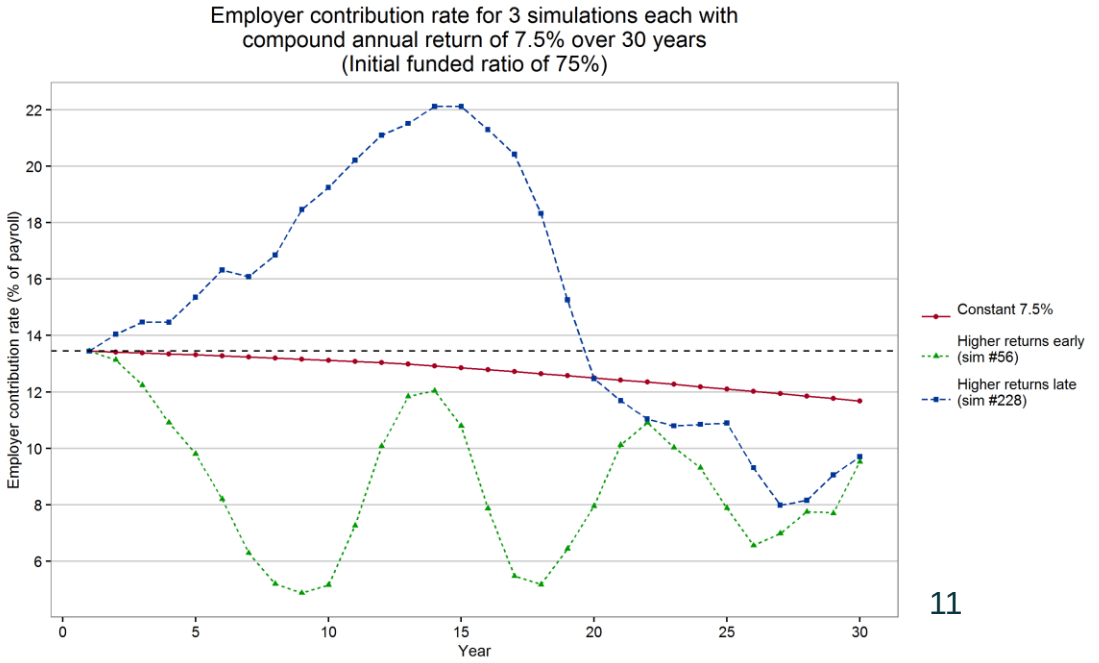
- 7.5% every year – (Red line)
- Higher returns in early years, lower later (Green line)
- Lower returns in early years, higher later (Blue line)

Plan is 75% funded in year 1

Top panel is funded ratio, bottom panel is employer contribution

*Appendix shows year-by-year returns



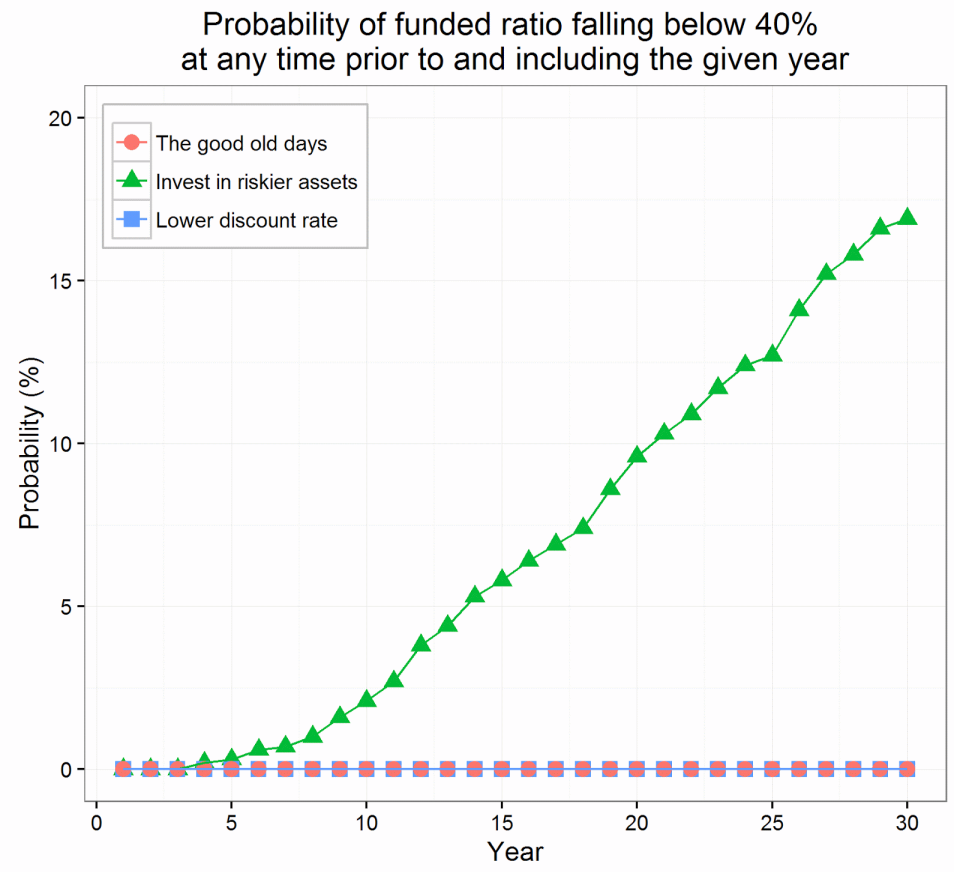


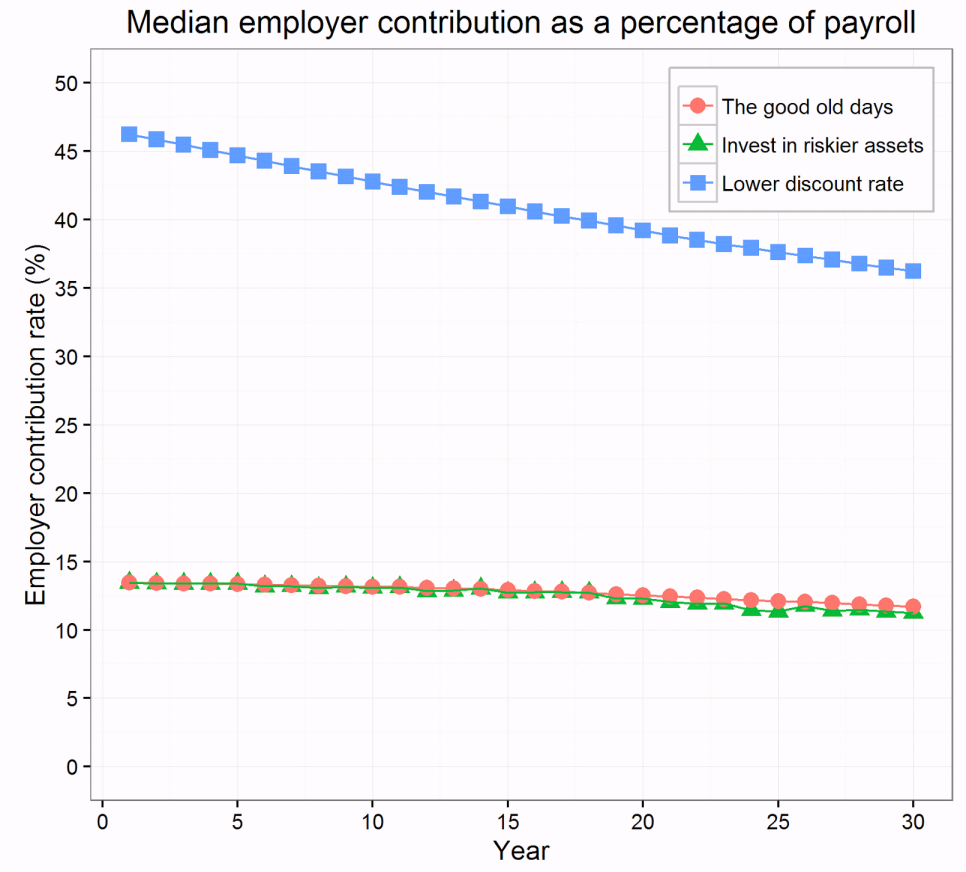
We examined two stylized scenarios in comparison to (stylized) current practice*

- Good old days: 7.5% compound return could be expected with very little risk (1.8% standard deviation) – no longer possible
- Invest in riskier assets: 7.5% expected compound return, 12% standard deviation – similar to what plans do now
- Maintain good-old-days risk level but reduce expected returns: 3.5% expected compound return, 1.8% standard deviation – arguably possible now, but huge near-term contribution increases would be required

* All 3 portfolios have the same Sharpe ratio. Plan is 75% funded in year 1. Funding policy is 30-year open-period level-percent with 5-year asset smoothing, which is similar to what many plans with large unfunded liabilities use. It is less common among smaller plans.

Unpleasant trade-off in our scenarios: increased risk of crisis-level funding to avoid a tripling of contributions





What does heightened risk suggest for policy and what might it portend for behavior?

- For policy, I think it means we need more disclosure of risk to those who bear risk, to those who act on risk-bearers' behalf (e.g., politicians, fund trustees), and to those who communicate with them (media). Maybe it suggests limits on risk-taking.
- If deciders decide long-term risks are too high, could lead to:
  - Lower assumed returns
  - Allocation away from riskier assets, perhaps toward assets with characteristics like pension liabilities (bond-like)
  - Substantially higher contribution requests
  - *Certain* and substantial crowding out now (services, taxes), rather than *risk* of greater (or lesser) crowding out later
  - Greater generational equity
  - Weakening public/political support for public DB pensions
  - Increased challenges to legal security of pensions, but greater funding security

Appendix

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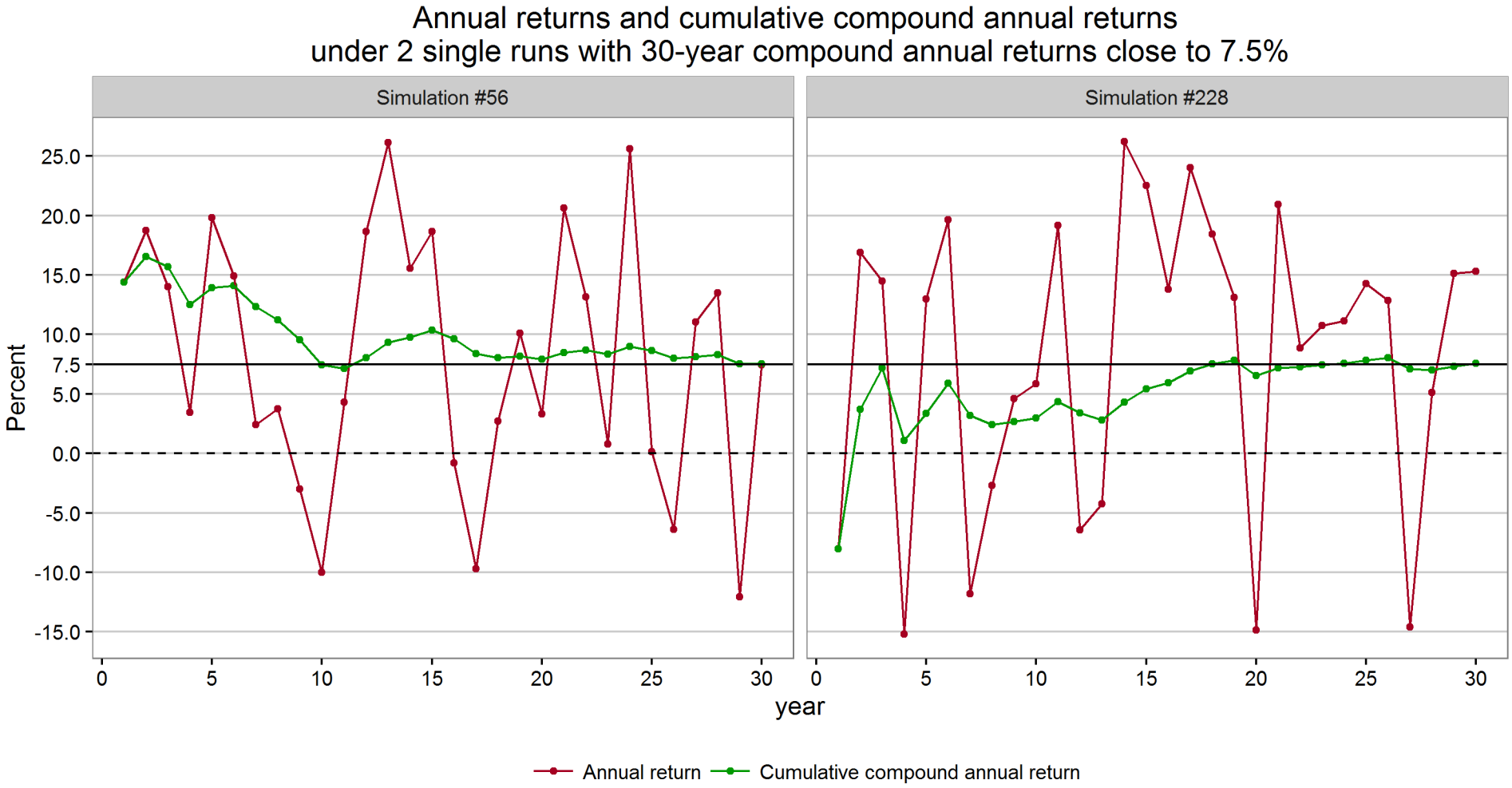
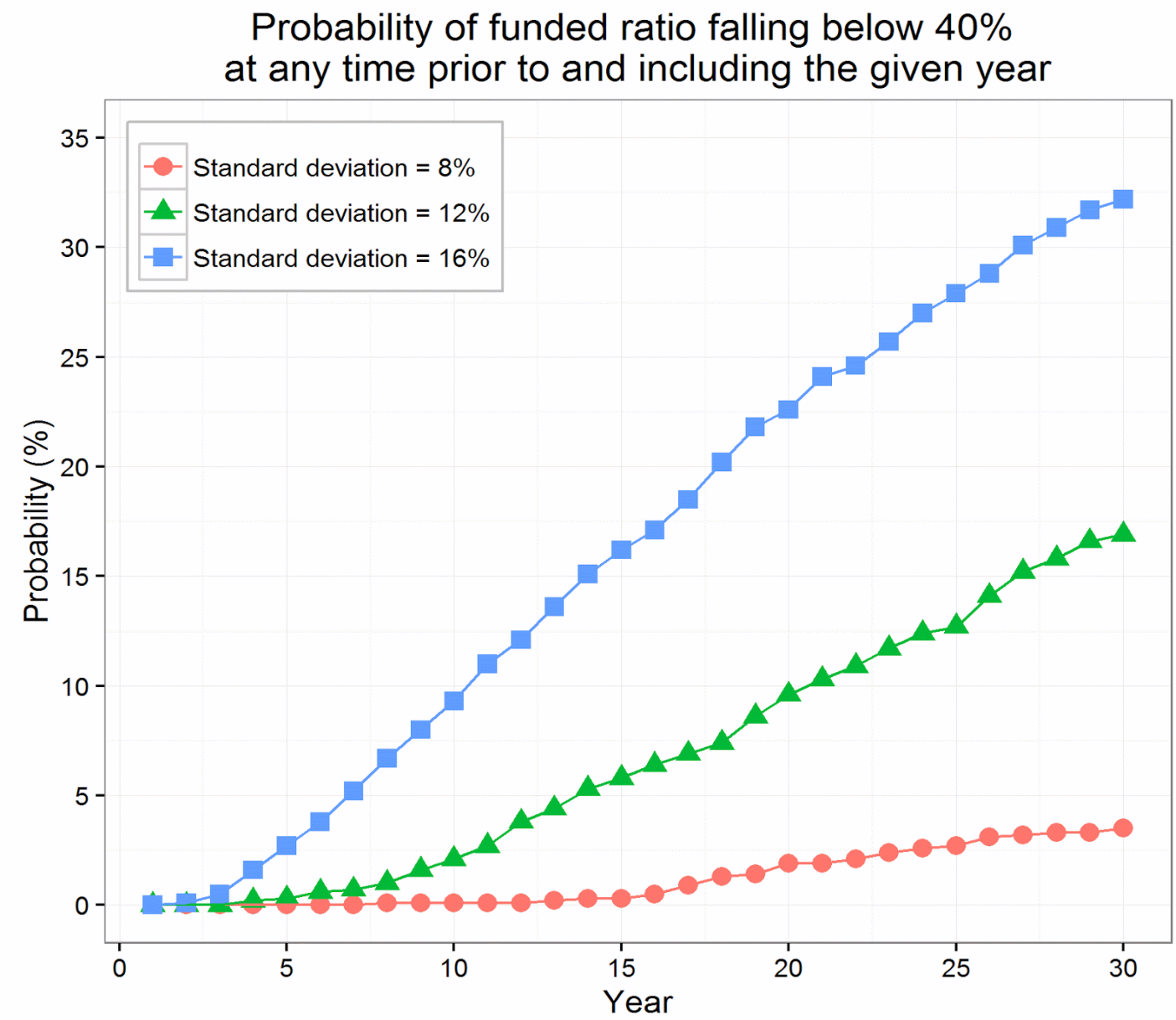
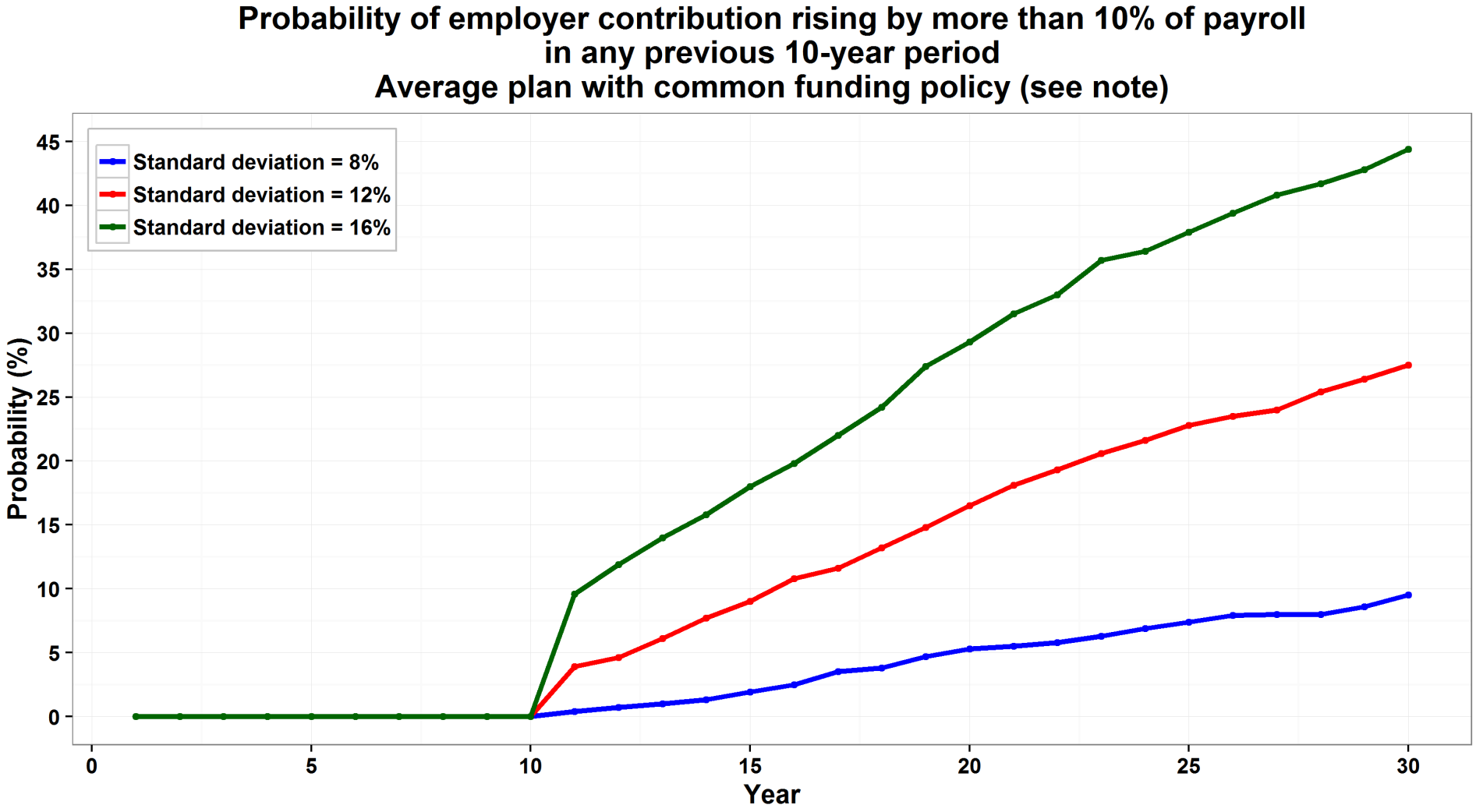
Annual returns and rolling compound returns for our higher-returns-early (left panel) and lower-returns-early (right panel) simulations



Volatility in isolation (no risk-reward): Risk of funding crisis is higher if investment-return volatility is higher



Volatility in isolation (no risk-reward): Risk of significant contribution increases is higher if investment-return volatility is higher



Note: Initial funded ratio of 75%, expected compound return of 7.5%, standard deviation as shown
30-year level-percent open, 5-year asset smoothing

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